

CONDUIT SHORTENING ADJUSTMENT ASSEMBLY

TECHNICAL FIELD

The subject invention relates to a motion transmitting remote control assembly of the type for transmitting motion in a curved path by a flexible motion transmitting core element movably supported in a conduit.

BACKGROUND OF THE INVENTION

Such remote control assemblies are used in automobiles to control heaters, vents, accelerators, throttles, parking-brake interlocks, etc. The length of the conduit must be adjustable during installation as the routing and distance between the connection points varies. A manually adjustable assembly is one wherein the length of the conduit changes as two telescoping members interconnect the ends of the conduit and move longitudinally relative to one another during installation to the adjusted position whereupon a locking member is moved to a locking position to interlock the two telescoping members to prevent any change in the length of the conduit. Examples of such assemblies are shown in U.S. Pat. Nos.: 3,572,159 to Tschanz; 4,117,691 to Fillmore; 5,161,428 to Petruccello; and 5,178,034 to Keasoner, all assigned to the assignee of the instant invention. An important attribute of such assemblies is that they include a spring which biases the telescoping members apart whereby the outward ends of the conduit are moved in the overall conduit shortening direction during installation just before the overall length of the conduit is fixed.

SUMMARY OF THE INVENTION AND ADVANTAGES

A motion-transmitting remote control assembly of the type for transmitting motion along a curved path by a flexible core element movably supported in first and second conduit sections and adjustment components interconnecting the first and second conduit sections for adjusting the overall length of the first and second conduit sections. The assembly is characterized by a spring interacting with the adjustment components to bias the components together to shorten the overall length of the first and second conduit sections.

In many installation situations it is desirable to increase the overall length of the conduit during the installation. This is accomplished by the subject invention wherein the telescoping members are biased into one another in the overall shortening direction instead of being biased apart as is prevalent in the prior art assemblies.

BRIEF DESCRIPTION OF THE DRAWINGS

Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view of a preferred embodiment of the subject invention;

FIG. 2 is cross sectional view taken substantially along line 2—2 of FIG. 1;

FIG. 3 is a cross sectional view taken along line 3—3 of FIG. 1;

FIG. 4 is an exploded perspective view of the preferred embodiment;

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FIG. 5 is a cross sectional view similar to FIG. 2 but showing the assembly in the shipping position:

FIG. 6 is a side elevational view of the male member of the preferred embodiment; and

FIG. 7 is a cross sectional view taken along line 7—7 of FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the Figures, wherein like numerals reference like or corresponding parts throughout the several views, a motion transmitting remote control assembly constructed in accordance with the subject invention is generally shown at 10. The motion transmitting remote control assembly 10 is of the type for transmitting motion in a curved path by a motion transmitting core element 12. The core element 12 is generally a wire or a plurality of stranded wires. The core element may also be divided into two parts along with the remainder of the assembly 10 and therefore include a connector for connecting the two core sections together, although such a connector is not shown many are well known in the art.

The assembly also includes first and second conduit sections. In the embodiment illustrated, the conduit sections include first 14 and second 16 conduits of the type well known in the art comprising an inner tubular member made of plastic and surrounded by wires or filaments helically disposed on a long lead angle with a plastic casing extruded about the long lay wires. The overall conduit includes the male fitting or first member 18 on the end of the first conduit section 14 and the female fitting or a second member 20 on the end of the second conduit section 16. The members 18 and 20 are made of plastic and molded about the respective ends of the conduit sections 18 and 20. It is to be understood that the subject invention may be implemented in assemblies which do not include the tubular flexible conduit sections, i.e., only the male and female members 18 and 20.

However, in the preferred embodiment the male and female members 18 and 20 define telescoping adjustment components interconnecting the first 14 and second 16 conduit sections for adjusting the overall length of the first and second conduit sections, i.e., the overall length of the conduit regardless of its makeup. The telescoping adjustment components include a locking member 19. The male member 14 includes adjustment teeth 21 therealong and the locking member 19 is supported by the female member 16 for engaging the teeth 21 in a locked position to prevent relative telescoping movement between the telescoping members 14 and 16. The locking member 19 is U-shaped with teeth 23 on the interior of the legs for engaging the teeth 21 on the male member 14. Hooks 25 are disposed at the distal ends of the legs and detent recesses 27 are disposed in the female member 16 for engaging the hooks 25 in an intermediate position out of engagement with the teeth 21. The female member 16 also presents catches 28 for engaging and retaining the hooks 25 to lock the locking member 19 in the locked position, as shown in FIG. 2. The locking member 19 includes a cap which engages the top of the female member 16 to limit the inward locking movement of the locking member 19.

This assembly 10 is characterized by a spring 22 interacting with the male and female adjustment components 18 and 20 to bias the components 18 and 20 together to shorten the overall length of the first and second conduit sections 14 and 16. a retainer 24 is disposed on one of the telescoping members during assembly thereof for retaining the spring 22

in compression; more specifically, the retainer is a projection on the male member 18. The spring 22 is a coil spring spiraled or helically disposed around the male member 18. An abutment is presented or defined by the locking member 19 for reacting with the end of the spring 22 in place of the retainer 24 upon assembly of the male 18 and female 20 telescoping members so that the telescoping members 18 and 20 are biased together in the direction to shorten the overall length of the conduit sections 14 and 16. An annular collar or ring 26 reacts axially between the retainer 24 and the end of the spring 22 during assembly and reacts between the spring 22 and the locking member 19 during adjustment of the overall length of the conduit sections 14 and 16. The collar 26 is split for radial expansion as it is forced over the retainer projection 24 during assembly of the spring and collar onto the male member 18. The collar is normally biased to closely engage the exterior of the male member 18.

The locking member 19 includes a tunnel 30 extending therethrough and the retainer projection 24 could be disposed on the opposite side of the member 18 in which case it would be movable through the tunnel 30 during telescoping movement of the male 18 and female 20 members in the conduit lengthening direction to allow the abutment on the locking member 19 to react with the collar and therefore the spring.

The male member 18 defines an inner end 32 and the female member 20 presents a bottom end wall 34. The inner end 32 of the male member 18 is adjacent the bottom end wall 34 when the male member 18 is fully inserted into the female member 20 to define the shortest overall length of the conduit sections 14 and 16. As the retainer 24 presents a reaction surface for reacting with the collar 26, the reaction surface is axially spaced toward the bottom end wall 34 from the abutment presented by the locking member 19 when the inner end 32 of the male member 18 is adjacent the bottom end wall 34 of the female member 20. This is accomplished by a pillar 36 extending into the female member 20 from the bottom end wall 34 thereof. The pillar 36 has a bore therethrough and the core element 12 extends through the bore in the pillar 36. The male 18 and female 20 members include complementary keyways 38 and 40 for rotary orientation of the male member 18 relative to the female member 20 to align the retainer projection 24 within the locking member 19. The keyways 38 and 40 extend axially along the exterior of the pillar 36 and the interior of a bore into the end 32 of the male member 18. Furthermore, the male member 18 presents an internal limit surface 42 for engaging the inner conical end of the pillar 36 to limit the insertion of the male member 18 into the female member 20 to define the shortest overall length of the conduit.

Additionally, the male member 18 includes a sealing length adjacent the inner end 32 thereof in sliding engagement with the interior of the female member 20 and a reduced cross section defining a spring seat 44 therebetween. The spring 22 reacts between the spring seat 44 and the collar 26. An o-ring seal 46 seals the sealing length of the male member 18 and the interior of the female member 20.

Prior to shipment, the spring 22 is radially resilient enough to be forced over the retainer projection 24 and into engagement with the spring seat 44. The collar 26 follows the spring 22 and snaps over the retainer projection 24. The spring is in compression to react between the seat 44 and the collar 26 and is retained in this position as the male member 18 is inserted into the female member 20. The male member 18 is inserted into the female member 20 until the conical end of the pillar 36 abuts the tapered complementary surface 42 on the interior of the male member 18. In other words, the